# CIVIL ENGINEERING ( CODE NO. 09 )

## 1. Solid Mechanics

(1) Concurrent, Non concurrent and Parallel forces in a plane. Moment of Force and Varignon's theorem, Free Body Diagram, Conditions of Equilibrium, Frictional Forces.

(2) Stresses in pin connected frames, Graphical and Analytical methods of finding forces in members of Trusses and Reactions in Beams.

(3) Simple Stresses and Strains, Elastic constants and relations between them.

(4) Compound stresses, Principal Stresses and Strains. Mohr's circle. Theories of Elastic Failure.

(5) Bending Moments and Shear Forces in beams.

(6) Bending stresses and Shear Stresses in beams.

(7) Deflections in beams: Macaulay's method, Moment Area method, Conjugate Beam method, Unit Load method : Strain Energy in direct stress, bending and shear.

(8) Elastic stability of Columns : Euler's, Rankine's and Secant formulae.

(9) Torsion of Shafts, Transmission of Power, Combined Bending Torsional and Direct Stresses.

(10) Helical springs, Unsymmetrical bending.

(11) Thin Cylinders and Spherical Shells under internal and external pressure.

## 2. Basic Structural Analysis

Determinate and Indeterminate Structures, Static and Kinematic Indeterminacy, Analysis of determinate pin-jointed trusses arches and cables , Concept of influence line for determinate structures, principles of virtual work and superpositions .

## 3. Fluid Mechanics

(1) Fluid properties and their role in fluid motion, Fluid Statics : Pressure at a point, forces on plane and curved surfaces. Buoyancy, Stability of floating and submerged bodies.

(2) Kinematics and Dynamics of fluid flow : Continuity, Momentum and Energy Equations applied to flow in Closed Conduits and Free Surface Flow. Flow net their utility and methods of drawing flow net.

(3) Dimensional Analysis and Similitude : Units & Dimensional Analysis Buckingham Pi theorem, Similitude theory Model Laws. Laminar & Turbulent Flow. Reynolds number, Laminar flow between parallel plates, flow through circular pipes.

(4) Open Channel Flow: Uniform and Non Uniform flow, Specific Energy, Critical Depth, Channel Geometry.

**4. Geotechnical Engineering**

(1) Formation of Soil, Basic definitions and Index Properties. Grain Size Analysis.

(2) Consistency limits.

(3) Soil Structure.

(4) I.S. Classification.

(5) Soil Water, Permeability, Lab, Methods, Seepage Flow net and its uses.

(6) Effective, neutral and total Stresses.

(7) Stress distribution in soils, Bouninesq equation.

(8) Compaction of soils, Lab, tests, Compressibility and Consolidation, Consolidation test, Settlement computations.

(9) Shear Strength of soil, Mohr Coulomb failure theory, Lab. tests.

(10) Lateral Earth Pressure, Active Passive and rest conditions, Rankine and Coulomb's theory.

(11) Stability of Slopes, Taylor's Stability Number, Swedish Slip Circle method and Method of Slices.

(12) Bearing Capacity, Terzaghi's theory, I.S. Method of computation of Bearing Capacity. Plate Load Test.

**5. Surveying**

(1) General principles, Surveying by Chain, Compass and Plane table.

(2) Levelling, Types and adjustment of instruments, Fly, Reciprocal and Precise levelling.

(3) Theodolite : Components, measurement of angles, Traversing.,.

(4) Tacheometry : Tacheometric systems, principles, uses of analytic lens.

(5) Traversing and Contouring.

(6) Planimeter and its uses.

(7) Curves : Simple Circular Curve, Compound Curve, Reverse Curve, Characteristics of all these curves, setting out curves, Transition Curve, Setting out of Transition Curves.

(8) Introduction to GIS and Total Station.

(9) EDM methods.

**6. Building Planning, Materials and Construction**

(1) Planning, Building line, Open Space requirements, Orientation, Lighting and Ventilation.

(2) Materials : Stone, Brick, Lime, Cement, Sand, Concrete, Timber, Plywood, Laminates, Adhesives, Plastics, Paints, Laboratory tests on building materials as per B.I.S. Codes of practice, Ferro- cement.

(3) Construction : Building components & their functions, Foundation, Walls, Floors, Roofs, Stair Cases, Doors, Windows, Plastering and Painting.